

## CLAIMS

### WHAT IS CLAIMED:

1. A filtering medium for use in chemical reactors, comprising a plurality of ceramic filter units, at least some of the ceramic filter units having a plurality of openings and at least some of the openings extending therethrough having a shape selected from the group consisting of ellipses and trisoids.

2. The filtering medium of claim 1, wherein at least some of the ceramic filter units have a thickness of about  $\frac{1}{8}$  to  $1\frac{1}{2}$  inches.

3. The filtering medium of claim 1, wherein at least some of the ceramic filter units have closed plane shaped cross-sectional configuration, each having a width of about  $\frac{1}{4}$  to 3 inches at the widest point.

4. The filtering medium of claim 1, wherein at least some of the ceramic filter units have a polygonal cross-sectional configuration having a plurality of sides, the configuration selected from the group consisting of triangles, quadrilaterals, squares, rectangles, pentagons, hexagons, heptagons and octagons, each of the sides having a length of about  $\frac{1}{8}$  to 3 inches.

1           5.     The filtering medium of claim 1, wherein at least some of the ceramic filter units have  
2 an elliptical cross-sectional configuration selected from the group consisting of ellipses having minor  
3 axes ranging from about  $\frac{1}{4}$  to 2 inches and major axes ranging from about  $\frac{3}{8}$  to 3 inches and circles  
4 having diameters ranging from about  $\frac{1}{4}$  to 3 inches.

1           6.     The filtering medium of claim 1, wherein at least some of the ceramic filter units  
2 have a fluted surface.

1           7.     The filtering medium of claim 1, wherein the ceramic filter units have top and bottom  
2 surfaces, wherein at least one of the top and bottom surfaces are irregularly shaped.

1           8.     The filtering medium of claim 1, wherein the at least some of the ceramic filter units  
2 have about a 20 to 70 percentage void area.

1           9.     The filtering medium of claim 1, wherein the ceramic filter units, after being packed  
2 into the chemical reactor, form a filtration layer having about a 200 to 500 ft<sup>2</sup>/ft<sup>3</sup> packing factor.

1           10.    The filtering medium of claim 1, wherein the at least some of the ceramic filter units  
2 are formed of a ceramic which comprises a substrate having a substantially uniform coating of a  
3 selected catalyst including a porous alumina coating with one Group VI-B metal.

1           11.    The filtering medium of claim 10, wherein the Group VI-B metal is molybdenum.

1 12. The filtering medium of claim 1, wherein the at least some of the ceramic filter units  
2 comprise a substrate having a substantially uniform coating of a selected catalyst including a porous  
3 alumina coating with one Group VIII metal.

1 13. The filtering medium of claim 12, wherein a Group VIII metal is nickel or cobalt.

1 14. The filtering medium of claim 1, wherein a Group VI-B metal is impregnated into  
2 at least some of the ceramic filter units.

1 15. The filtering medium of claim 1, wherein a Group VIII metal is impregnated into at  
least some of the ceramic filter units.

1 16. The filtering medium of claim 1, wherein the at least some of the ceramic filter units  
2 are formed of a ceramic which contain a porous inorganic oxide selected from the group consisting  
3 of alumina, silica, silica-alumina, magnesia, alumina and titania.

1 17. The filtering medium of claim 1, wherein the at least some of the ceramic filter units  
2 contain a metal oxide selected from the group consisting of titanium, tin, lead, zirconium, ruthenium,  
3 tungsten, yttrium, nickel, magnesium, calcium, aluminum, silicon or boron.

1 18. The filtering medium of claim 1, wherein the at least some of the ceramic filter units  
2 contain a metal nitride selected from the group consisting of titanium, zirconium, tungsten, silicon  
3 or boron.

1 19. The filtering medium of claim 1, wherein the at least some of the ceramic filter units  
2 contain a metal carbide selected from the group consisting of titanium, zirconium, tungsten, silicon  
3 or boron.

1 20. The filtering medium of claim 1, wherein the at least some of the ceramic filter units  
2 contain a metal boride selected from the group consisting of titanium, zirconium or tungsten.

1 21. The filtering medium of claim 1, wherein the at least some of the ceramic filter units  
2 contain a zeolite selected from the group consisting of zeolite L, zeolite X and zeolite Y.

1 22. A method of removing contaminants from a contaminated organic-based feed stream,  
2 in a chemical reactor, comprising the steps of:

- 3 (a) providing a layer of ceramic filter units, at least some of the ceramic filter units  
4 having a plurality of openings extending therethrough, at least some of the openings  
5 having a shape selected from the group consisting of ellipses and trisoids, the layer  
6 of ceramic filter units being in an amount sufficient to filter the contaminant from the  
7 organic-based feed stream; and  
8 (b) passing the contaminated organic-based feed stream through the layer of ceramic  
9 filter units.

10 23. A method of removing contaminants from a contaminated organic-based feed stream  
11 in a chemical reactor, comprising the steps of:

- 12 (a) providing a layer of ceramic filter units, at least some of the ceramic filter units  
13 having a plurality of openings extending therethrough, at least some of the openings  
14 having a shape selected from a group consisting of ellipses and trisoids ; and  
15 (b) contacting the contaminated organic-based feed stream with the ceramic filter units  
16 to remove the contaminants from the contaminated organic-based feed stream.

1 24. The method of claim 23, including the step of providing a decontaminated organic-  
2 based feed stream for further processing in the chemical reactor.

1           25.    The method of claim **23**, including the step of utilizing at least some ceramic filter  
2 units having a thickness of about  $\frac{1}{8}$  to  $1\frac{1}{2}$  inches.

1           26.    The method of claim **23**, including the step of utilizing at least some ceramic filter  
2 units having a closed plane shape cross-sectional configuration, each having a width of about  $\frac{1}{4}$   
3 to 3 inches at the widest point.

1           27.    The method of claim **23**, including the step of utilizing at least some ceramic filter  
2 units having a polygonal cross section, selected from the group consisting of triangles, quadrilaterals,  
3 squares, rectangles, pentagons, hexagons, heptagons and octagons, each side of the polygon to have  
4 a length of about  $\frac{1}{8}$  to 3 inches.

1           28.    The method of claim **23**, including the step of utilizing at least some ceramic filter  
2 units having an elliptical cross section selected from the group consisting of ellipses having minor  
3 axes ranging from about  $\frac{1}{4}$  to 2 inches and major axes ranging from about  $\frac{7}{8}$  to 3 inches and  
4 circles having diameters ranging from about  $\frac{1}{4}$  to 3 inches.

1           29.    The method of claim **23**, including the step of utilizing at least some ceramic filter  
2 units having a fluted surface.

1           30.     The method of claim **23**, including the step of utilizing at least some ceramic filter  
2 units having top and bottom surfaces, wherein at least one of the top and bottom surfaces are  
3 irregularly shaped.

1           31.     The method of claim **23**, including the step of utilizing at least some ceramic filter  
2 units having about a 20 to 70 percentage void area.

1           32.     The method of claim **23**, including the step of utilizing at least some ceramic filter  
2 units forming a filtration layer having about a 200 to 500 ft<sup>2</sup>/ft<sup>3</sup> packing factor.

1           33.     The method of claim **23**, wherein the step of contacting the contaminated organic-  
2 based feed stream with the ceramic filter units includes depositing a catalyst on at least some of the  
3 ceramic filter units.

1           34.     The method of claim **23**, including the step of utilizing at least some ceramic filter  
2 units as a ceramic substrate having a substantially uniform coating of a selected catalyst including  
3 a porous alumina coating with one Group VI-B metal.

1           35.     The method of claim **34**, wherein the Group VI-B metal is molybdenum.

1           36.    The method of claim 23, including the step of utilizing at least some ceramic filter  
2 units as a ceramic substrate having a substantially uniform coating of a selected catalyst including  
3 a porous alumina coating with one Group VIII metal.

1           37.    The method of claim 36, wherein a Group VIII metal is nickel or cobalt.

1           38.    The method of claim 23, including the step of utilizing a Group VI-B metal  
2 impregnated into at least some of the ceramic filter units.

1           39.    The method of claim 23, including the step of utilizing a Group VIII metal  
2 impregnated into at least some of the ceramic filter units.

1           40.    The method of claim 23, including the step of utilizing at least some ceramic filter  
2 units contain a porous inorganic oxide selected from the group consisting of alumina, silica, silica-  
3 alumina, magnesia, silica-magnesia and titania.

1           41.    The method of claim 23, including the step of utilizing at least some ceramic filter  
2 units contain a metal oxide selected from the group consisting of titanium, tin, lead, zirconium,  
3 ruthenium, tungsten, yttrium, nickel, magnesium, calcium, aluminum, silicon or boron.



1           42.    The method of claim 23, including the step of utilizing at least some ceramic filter  
2 units contain a metal nitride selected from the group consisting of titanium, zirconium, tungsten,  
3 silicon or boron.

1           43.    The method of claim 23, including the step of utilizing at least some ceramic filter  
2 units contain a metal carbide selected from the group consisting of titanium, zirconium, tungsten,  
3 silicon or boron.

1           44.    The method of claim 23, including the step of utilizing at least some ceramic filter  
2 units contain a metal boride selected from the group consisting of titanium, zirconium or tungsten.

1           45.    The method of claim 23, including the step of utilizing at least some ceramic filter  
2 units contain a zeolite selected from the group consisting of zeolite L, zeolite X and zeolite Y.

1 46. A method of fluid distribution in a chemical reactor comprising the steps of:

- 2 (a) providing a layer of ceramic filter units, at least some of the ceramic filter units  
3 having a plurality of openings extending therethrough, and at least some of the  
4 openings having a shape selected from the group consisting of ellipses and trisoids,  
5 at least some of the ceramic filter units having a plurality of flow passageways  
6 defined by the plurality of openings extending through the ceramic filter units;  
7 (b) contacting an organic-based feed stream with the layer of ceramic filter units; and  
8 (c) subdividing the organic-based feed stream into a plurality of smaller fluid streams  
9 by passing the organic-based feed stream through the plurality of flow passageways  
10 defined by the plurality of openings.

11 47. The method of claim 46 including the steps of: removing contaminants from a  
12 contaminated organic-based feed stream; and providing a decontaminated and uniformly spread  
13 organic-based feed stream to a catalyst bed for further processing in the chemical reactor.  
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